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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,308	10/09/2003	Jin Li	M4065.0965/P965	7977

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EXAMINER

HARRINGTON, ALICIA M

ART UNIT PAPER NUMBER

2873

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/681,308	Applicant(s) LI ET AL.	
	Examiner Alicia M. Harrington	Art Unit 2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 8/24/05.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-27, 30-45 and 56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-27, 30-45 and 56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-9, 11-27, 30-45 and 56 have been considered but are moot in view of the new ground(s) of rejection with Foster (US 6,643,386) and Omori Hiroki (JP2000-260968).

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 43 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 36 was amended to recite, "said second micro-lenses contacts without overlapping at least one of the first micro-lenses". Claim 43, which depends from claim 24, recites "second mirco-lenses overlaps surrounding one of said first micro lenses". The Examiner is unclear as to applicant intended for them to overlap or not overlap. Thus, applicant fails to particularly point out and distinctly the subject matter applicant regards as the invention.

Claim 43 will not be treated on the merits.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1,17,18,24,36,39,42 are rejected under 35 U.S.C. 102(b) as being anticipated by Tokumitsu (US 5,238,856).

Regarding claim 1, Tokumitsu discloses a micro-lens array, comprising:

a first set of micro-lenses comprising a plurality of first micro-lenses (first height;Mg) each having a first size; and

a second set of micro-lenses comprising a plurality of second micro-lenses (second height;Cy) each having a second size (figure 13);

wherein at least one of said plurality of first micro-lenses at least abuts at least one of said plurality of second micro-lenses (see col. 6, lines 14-39).

Regarding claim 17, Tokumitsu discloses a pixel array having embedded pixels cells (see figure 13) and a micro-lens array; a micro-lens array comprising:

A first set of micro lenses has a first size (first height);

A second set of micro lenses second height) has a second size;

Wherein the micro-lens array is substantially gapless between the plurality of first micro-lenses and at least one of the second micro lenses.

Regarding claim 18, see figure 13 and col. 6, lines 1-10.

Regarding claim 24, Tokumistu discloses a semiconductor-based imager, comprising:

a substrate having pixel cells formed thereon (see figure 13), each with a see (2);

a micro-lens array (205), comprising:

a first plurality of first micro-lenses each having a first size (MG); and

a second plurality of second micro-lenses each having a second size (CY) larger than said first size;

wherein said second micro-lenses (CY) are adapted to collect a greater amount of light than said first micro-lenses;

wherein at least one of said second micro-lenses abuts at least one of said first micro-lenses(see figure 13 and col. 6.)

Regarding claim 36, see figures 12-13 and col. 6. The first lens is (MG or G) and second lens is CY.

Regarding claim 39, see col. 6, lines 1-10.

Regarding claim 42, see col. 6,lines 1-11.

6. Claims 1-3,6-7,11-18,20,21,24,30,31,33-39,44,45,56 are rejected under 35 U.S.C. 102(b) as being anticipated by Foster (US 6,643,386).

Regarding claim1, Foster discloses a micro-lens array, comprising:

a first set of micro-lenses comprising a plurality of first micro-lenses (see figure 6 for example #38; or #52 of figure 6 or #38 of see figure 3) each having a first size; and

a second set of micro-lenses comprising a plurality of second micro-lenses each having a second size (#38 or #52 of figure 6 or #38 of figure 3);

wherein at least one of said plurality of first micro-lenses at least abuts at least one of said plurality of second micro-lenses (see col. 4, lines 9-45 and col. 6).

Regarding claim 2, Foster discloses a third size (#54).

Regarding claim 3, Foster discloses equal sizes in figure 3.

Regarding claim 6, Foster discloses a first set (38 of figure 6 or 3); second set (52 of figure 6 or 38 of figure 3) and third set (54 of figure 6 or 38 of figure 3); wherein the first lenses abut without overlapping the second and third set-see figure 6 and col. 6.

Regarding claim 7, Foster discloses the micro-lens array of claim 6, wherein said first micro-lenses have a first size (38) and said second micro-lenses have a second size (52), said second size being no smaller than said first size (38)- in the embodiment of figure 6.

Regarding claim 11, see the embodiment of figure 3 in Foster.

Regarding claims 12-13, Foster discloses an embodiment of figure 5 comprising a first set (48) and second set (46) and third set (38) where the first set exhibit different optical transmission properties than said second set and the first and second abut without overlapping.

Regarding claims 14-15, Foster discloses the third set exhibits different optical transmission properties than the first and second-see col. 5, lines 49-65 (additive primary or subtractive secondary).

Regarding claim 16, Foster discloses the first micro lens abuts the second and third micro lenses-see figure 5.

Regarding claims 17 and 24, Foster discloses pixel array (see col. 4, lines 10-19) with photo sensor and micro lenses comprising a first set (38 of figure 3 or see figure 6 for example); a second set (52 of figure 6; or 38 of figure 3); wherein the micro lens array is substantially space-less (abuts) between the micro lenses.

Regarding claim 18, Foster discloses the first size is different from the second size (see figure 6).

Regarding claim 20-21 and 33, 35 and 56, Foster discloses a third size (54); wherein the micro lens array is substantially space-less between (abuts) the micro lenses.

Regarding claims 30 and 31, see element 30 of figure 6 of Foster.

Regarding claim 34, see the embodiment of figure 3.

Regarding claim 36-39 and 44, the first (38) micro lens, second micro lens (52), and third micro lens (54) with color filter (30) and substrate (28) of figure 6 or the embodiment of figure 3 where first, second and third micro lenses are the same size.

Regarding claim 45, see the embodiment of figure 3.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 4,5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tokumitsu (US 5,238,856) in view of Li (US 2002/0176037).

Regarding claims 4-5, Tokumitsu teaches different curvature and thicknesses changes the sensitiveness (see col. 5, lines 50-60) and the adjustment of the curvature adjusts the focal the focal length of the lens (see col. 6, lines 1-10). However, Tokumitsu fails to specifically disclose the focal length of each of the plurality of first micro lenses is equal to the second micro lenses.

In the same field of endeavor, Li teaches the lens curvature, thickness, material and resulting focal length are well known art optical calculations done to provide proper focus of the color micro lens at the sensor (see sections 25-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that focal lengths of the first and second are approximately equal because the pixel sites of the first and second lens are at the same depth and it to assures each lens focuses light onto the pixel sight and not in the layers-loss light.

8. Claims 8,9,22,23,25-27,40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foster (US 6,643,386) in view of Li (US 2002/0176037).

Regarding claim 8,22,25,26,40-41, Foster fails to specifically disclose the focal lengths of the lenses are approximately the same.

In the same field of endeavor, Li teaches the lens curvature, thickness, material and resulting focal length are well known art optical calculations done to provide proper focus of the micro lens at the sensor (see sections 25-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that focal

lengths of the first and second are approximately equal because the pixel sites of the first, second lens and third lenses are in the same substrate and it to assures each lens focuses light onto the pixel sight and not in the layers-loss light.

Regarding claim 9,23,27,42 Foster discloses the sizes of the lens are varied and the color filters adjacent the lens can be a variety of colors-see col. 6. However, Foster fails to specifically disclose the focal lengths are adjusted according to the color signal.

In the same field of endeavor, Li teaches the lens curvature, thickness, material and resulting focal length are well known art optical calculations done to provide proper focus of the micro lens at the sensor (see sections 25-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the focal length according the color/wavelength of light, since the wavelength would affect how deeply the light at the different wavelengths would enter the photo-sensor region and for the specific purpose of providing a good color response one would want the lights stopping at the photo sensor only, not other regions of the substrate.

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Foster (US 6,643,386) in view of Omori Hiroki (JP 200-260968).

Regarding claim 19, Foster discloses the micro lenses and/or filters may be primary colors (RGB). However, Foster fails to specifically discloses the first lens (smaller) corresponds to the green pixel cell and second micro lenses (larger) corresponds to a red and/or blue pixel cell.

In the same field of endeavor, Hiroki discloses a color image sensor where the sizes of the micro lenses for red and blue are larger than the micro lenses for the green

pixel cells (see solution section). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Foster, as taught by Hiroki, for the specific purpose of reducing noise in the low sensitivity colors.

10. Claims 17-27,30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hokari (US 5,493,143) in view of Tokumitsu (US 5,238,856).

Regarding claims 17,19 and 21, Hokari discloses a semiconductor-based imager comprising:

A pixel array having embedded pixels cells (see figure 5 for example) and a micro-lens array (9); a micro-lens array comprising:

A first set of micro lenses has a first size (green; see figure 9);

A second set of micro lenses (blue) has a second size;

Wherein the micro-lens array is close between the plurality of first micro-lenses and at least one of the second micro lenses. Hokari fails to specifically disclose the semiconductor-based imager includes a wherein the micro-lens array that is approximately space-less between at least one of the first and second micro-lenses.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact or overlap (see **col. 5, lines 25-35** and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a patterning method for

forming the micro lenses without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 18, Hokari illustrates the first size (green) is different and would receive a greater amount of light than the second size (blue)- see figure 9 for example.

Regarding claim 20, Hokari discloses a third set of micro-lenses having a third size (see figure 9; red).

Regarding claim 22, Hokari illustrates in the embodiment of figure 9, equal focal lengths (focused to the same depths in the substrate).

Regarding claim 23, Hokari illustrates in the embodiment of figure 8, adjusting the curvature according to the color.

Regarding claim 24, Hokari discloses a semiconductor-based imager, comprising:
a substrate (1) having pixel cells formed thereon (see col. 3, lines 40-50), each with a see (2);

a micro-lens array (9), comprising:

a first plurality of first micro-lenses each having a first size (for example 9G); and

a second plurality of second micro-lenses each having a second size (for example 9R-height or 9B-surface area; see col. 6, lines 40-61) larger than said first size (9G-see figures 8-11);

wherein said second micro-lenses (for example 9B) are adapted to collect a greater amount of light than said first micro-lenses (9G- the Blue lens is larger surface area-see for example figure 11). Hokari fails to specifically disclose the semiconductor-based

imager of claim 24, wherein at least one of said second micro-lenses abuts at least one of said first micro-lenses.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact (see **col. 5, lines 25-35** and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a patterning method for forming the micro lenses without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 25, Hokari discloses the semiconductor-based imager of claim 24, wherein said first (9G) and said second (for example 9B) micro-lenses each exhibit a similar focal length (In one embodiment, the micro lens material is wavelength selective and the light for individual wavelengths are focused at the photo sensor- see figures 9, 10e and 11- col. 5, lines and 15-20 and 50-55).

Regarding claim 26, Hokari discloses the semiconductor-based imager of claim 25, wherein said focal length extends to said photo sensors (see figure 9 and col. 5, lines 15-20).

Regarding claim 27, Hokari discloses the semiconductor-based imager of claim 24, wherein a focal length of the plurality of first micro-lenses is adjusted for a first color signal, and wherein a focal length of the plurality of second micro-lenses is adjusted for

a second color signal (In the embodiment of figure 8, each lens had a different curvature and thickness-see col. 5, lines 25-50).

Regarding claim 30, Hokari discloses the semiconductor-based imager of claim 24, further comprising a color filter array (20G, 20R, 20B) positioned over said pixel cells (see figure 9; col. 5, lines 55-65).

Regarding claim 31, Hokari discloses the semiconductor-based imager of claim 30, wherein said color filter (20G, 20R, 20B) array is positioned between said micro-lens array (9) and said wafer (1).

Regarding claim 32, Hokari discloses the semiconductor-based imager of claim 24, further comprising a light shield (7) positioned between said micro-lens array (9) and said wafer (1).

Regarding claim 33, Hokari discloses the semiconductor-based imager of claim 24, wherein said micro-lens array further comprises a third plurality of third micro-lenses each having a third size (for example 12 R).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Summa (US 2004/0140832).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alicia M. Harrington whose telephone number is 571 272 2330. The examiner can normally be reached on Monday - Thursday 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Mack can be reached on 571 272 2333. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



AMH

Alicia M Harrington
Primary Examiner
Art Unit 2873